C5941
Log Data Report

Borehole Information:

Borehole:	C5941		Site:	216-A-30 Crib	
Coordinates (WA St Plane)		GWL[1] (ft):	283.75	GWL Date:	04/22/08
North (m)	East (m)	Drill Date	TOC[2] Elevation	Total Depth (ft)	Type
Unknown	Unknown	03/2008	Unknown	300	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded Steel	1.7	10 13/16	9 5/8	19/32	0	178
Threaded Steel	3.8	8 5/8	7 9/16	17/32	0	299

Borehole Notes:

On the ground surface is a 6 to 8-in gravel pad. Borehole is located within a wooden shed. Logger measured casting using a steel tape and rounding to the nearest 1/16-in. The zero reference is the top of the ground surface.

This borehole was logged over several days. The first logging event occurred on 3/20/08, which a maximum logging depth achieved was 89.0 ft. The second logging event occurred on 4/03/08, which a maximum logging depth achieved was 180.0 ft. The third logging event occurred on 4/22/08, which a maximum logging depth of 300 ft. was achieved.

Logging Equipment Information:

Logging System:	Gamma 4 L		Type: / Serial No.:	SGLS HPGe (60%) / 47TP32211A
Effective Calibration Date:	12/31/07	Calibration Reference:	HGLP-CC-027	
		Logging Procedure:	HGLP-MAN-002, Rev. 0	

Logging System:	Gamma 4 H		Type: / Serial No.:	NMLS / H310700352
Effective Calibration Date:	11/06/07	Calibration Reference:	HGLP-CC-021	
		Logging Procedure:	HGLP-MAN-002, Rev. 0	

Logging System:	Gamma 4 H		Type: / Serial No.:	PNLS / H310700352
Effective Calibration Date:	None Required	Calibration Reference:	None Required	
		Logging Procedure:	HGLP-MAN-002, Rev. 0	

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2 Repeat	7	8 Repeat	13
Date	03/20/08	03/20/08	04/03/08	04/03/08	04/22/08
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	0.0	15.0	87.0	105.0	177.0
Finish Depth (ft)	89.0	25.0	180.0	115.0	300.0
Count Time (sec)	100	100	100	100	100
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N

Log Run	1	2 Repeat	7	8 Repeat	13
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	DL201CAB	DL201CAB	DL231CAB	DL231CAB	DL291CAB
Start File	DL201000	DL201090	DL231000	DL231094	DL291000
Finish File	DL201089	DL201100	DL231093	DL231104	DL291123
Post-Verification	DL201CAA	DL201CAA	DL231CAA	DL231CAA	DL291CAA
Depth Return Error (in.)	N/A	N/A	N/A	Low 1	N/A
Comments	No fine gain adjustment made.	Repeat section.	No Fine gain adjustment made.	Repeat section.	Fine gain adjustment made after files 72 and 83

Log Run	14 Repeat				
Date	04/22/08				
Logging Engineer	Spatz				
Start Depth (ft)	177.0				
Finish Depth (ft)	300.0				
Count Time (sec)	100				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	1.0				
ft/min	N/A				
Pre-Verification	DL291CAB				
Start File	DL291124				
Finish File	DL291139				
Post-Verification	DL291CAA				
Depth Return Error (in.)	3 Low				
Comments	Repeat section.				

Neutron Moisture Logging System (NMLS) Log Run Information:

Log Run	3	4 Repeat	9	10 Repeat	15
Date	03/20/08	03/20/08	04/04/08	04/04/08	04/22/08
Logging Engineer	Spatz	Spatz	Pearson	Pearson	Pearson
Start Depth (ft)	0.0	15.0	87.0	140.0	177.0
Finish Depth (ft)	88.50	25.0	180.0	150.0	277.0
Count Time (sec)	15	15	15	15	15
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	0.25	0.25	0.25	0.25	0.25
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	DHC42CAB	DHC42CAB	DHC72CAB	DHC72CAB	DHD22CAB
Start File	DHC42000	DHC42355	DHC72000	DHC72373	DHD22000
Finish File	DHC42354	DHC42395	DHC72372	DHC72413	DHD22400
Post-Verification	DHC42CAA	DHC42CAA	DHC72CAA	DHC72CAA	DHD22CAA
Depth Return Error (in.)	N/A	0	N/A	1 Low	N/A
Comments	None	Repeat section.	None	Repeat section.	None

Log Run	16	17 Repeat			
Date	04/22/08	04/22/08			
Logging Engineer	Pearson	Pearson			

Log Run	16	17 Repeat			
Start Depth (ft)	277.25	272.0			
Finish Depth (ft)	283.0	283.0			
Count Time (sec)	15	15			
Live/Real	R	R			
Shield (Y/N)	N	N			
MSA Interval (ft)	0.25	0.25			
ft/min	N/A	N/A			
Pre-Verification	DHD22CAB	DHD22CAB			
Start File	DHD22401	DHD22425			
Finish File	DHD22424	DHD22469			
Post-Verification	DHD22CAA	DHD22CAA			
Depth Return Error (in.)	N/A	2 Low			
Comments	Changed Directory	Repeat section			

Passive Neutron Logging System (PNLS) Log Run Information:

Log Run	5	6 Repeat	11	12 Repeat	18
Date	03/20/08	03/20/08	04/04/08	04/04/08	04/22/08
Logging Engineer	Spatz	Spatz	Pearson	Pearson	Pearson
Start Depth (ft)	0.0	15.0	87.0	140.0	177.0
Finish Depth (ft)	89.0	25.0	180.0	150.0	283.0
Count Time (sec)	60	60	60	60	60
Live/Real	R	R	R	R	R
Shield (Y/N)	N	N	N	N	N
MSA Interval (ft)	1.0	1.0	1.0	1.0	1.0
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	DHC52CAB	DHC52CAB	DHC82CAB	DHC82CAB	DHD32CAB
Start File	DHC52000	DHC52090	DHC82094	DHC82094	DHD32000
Finish File	DHC52089	DHC52100	DHC82104	DHC82104	DHD32106
Post-Verification	DHC52CAA	DHC52CAA	DHC82CAA	DHC82CAA	DHD32CAA
Depth Return Error (in.)	N/A	N/A	N/A	1 Low	N/A
Comments	None	Repeat section	None	Repeat section	None

Log Run	19 Repeat				
Date	04/22/08				
Logging Engineer	Pearson				
Start Depth (ft)	283.0				
Finish Depth (ft)	272.0				
Count Time (sec)	60				
Live/Real	R				
Shield (Y/N)	N				
MSA Interval (ft)	1.0				
ft/min	N/A				
Pre-Verification	DHD32CAB				
Start File	DHD32107				
Finish File	DHD32118				
Post-Verification	DHD32CAA				
Depth Return Error (in.)	2 Low				

Log Run	19 Repeat				
Comments	Repeat section				

Logging Operation Notes:

Data were collected using Gamma 4, HO 68B-3573. A centralizer was installed on the sonde prior to logging. The SGLS pre- and post-survey verification measurements were acquired in the Amersham KUTh-115 field verifier. The NMLS pre- and post-survey verification measurements were acquired in the standard field verifier. The PNLS pre- and post- survey measurements were acquired next to the AmBe source.

Analysis Notes:

Analyst:	Legler/ McCain	Date:	5/7/2008	Reference:	GJO-HGLP 1.6.3, Rev. 0

The SGLS pre- and post-survey verification spectra met the acceptance criteria for the established system, but the verification spectra files DL201CAB, DL291CAB, DL291CAA, and DL231CAA had measurements below the lower control limit for the 1461 keV energy line.

The NMLS pre- and post-survey verification spectra met the acceptance criteria for the established system, but all verification spectra have measurements above the upper control limit for count rate (cps).

Casing corrections for 19/32-in and 17/32-in thick casings were applied during analysis. A water correction was also applied from 283.75 ft to total logged depth of borehole.

SGLS spectra were processed in batch mode in APTEC SUPERVISOR to identify individual peaks and count rates. Concentrations for the SGLS were calculated using an EXCEL template identified as G4LDec07.xls using an efficiency function and corrections for casing dead time and water as determined by annual calibrations.

NMLS spectra were process in batch mode in APTEC SUPERVISOR to identify count rates. NMLS count rates were calculated using an EXCEL template identified as G4HNov07.xls. NMLS data are presented in counts per second (cps), because no calibration data exists for a 95/8-in and 7 9/16-in. borehole casing.

Results and Interpretations:

The only manmade radionuclide detected was Cs-137. Cs-137 was detected intermittently in this borehole at depth of 0 ft, 14 – 19 ft, 25 ft, 36 ft, 41 ft, 43 ft, 187 ft, 282 ft, and 288 ft with the maximum concentration being approximately 2.14 pCi/g at 18 ft. Inspection of the individual spectra at these depths indicate depths 0, 14 –19 ft, and 25 ft had measurable activity above background, and the remaining depths appear to be statistical fluctuations associated with the processing software.

The KUT and Manmade plots indicate good repeat ability. Radon is exhibited in log run 2 (87 – 180 ft) as shown by an elevated 609 keV peak relative to the 1764 keV peak.

Several zones of elevated total gamma with no corresponding manmade radionuclide or variations of natural radionuclides that would be attributed to the higher gamma counts seem to indicate the presence of Sr-90 (McCain, 2002). Three zones of possible Sr-90 contamination were identified using shape factor 2 analysis (SF2), which are 15 – 37 ft, 64 – 73 ft, and 106 – 122 ft.

References:

McCain, R.G. and C.J. Koizumi. 2002. *Correlation of Spectral Gamma Log Response and Sr-90 Concentrations for a Steel-Cased Borehole.* GJO-2002-322-TAR. Prepared by MACTEC-ERS for the Grand Junction Office. Grand Junction, Colorado.

List of Log Plots:

Depth Reference is top of ground surface

Manmade Radionuclides
Natural Gamma Logs
Combination Plots
Combination Plot (0-340 ft)
Total Gamma & Dead Time
Passive Neutron & Moisture
Repeat Section of Manmade Radionuclides
Repeat Section of Natural Gamma Logs
Repeat Section of Moisture

[1] GWL – groundwater level
[2] TOC – top of casing

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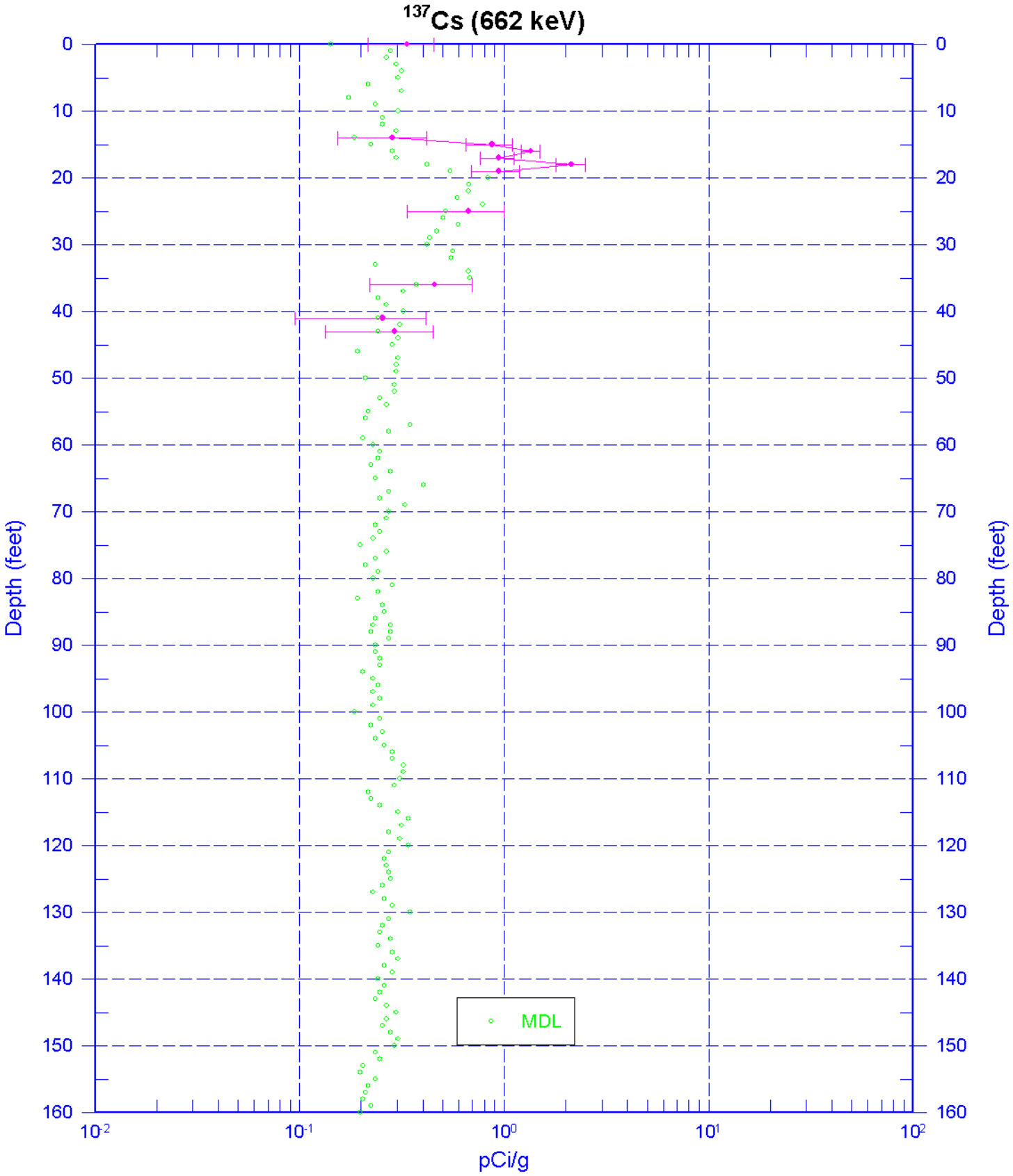
Manmade Radionuclides



Zero Reference - Ground Surface

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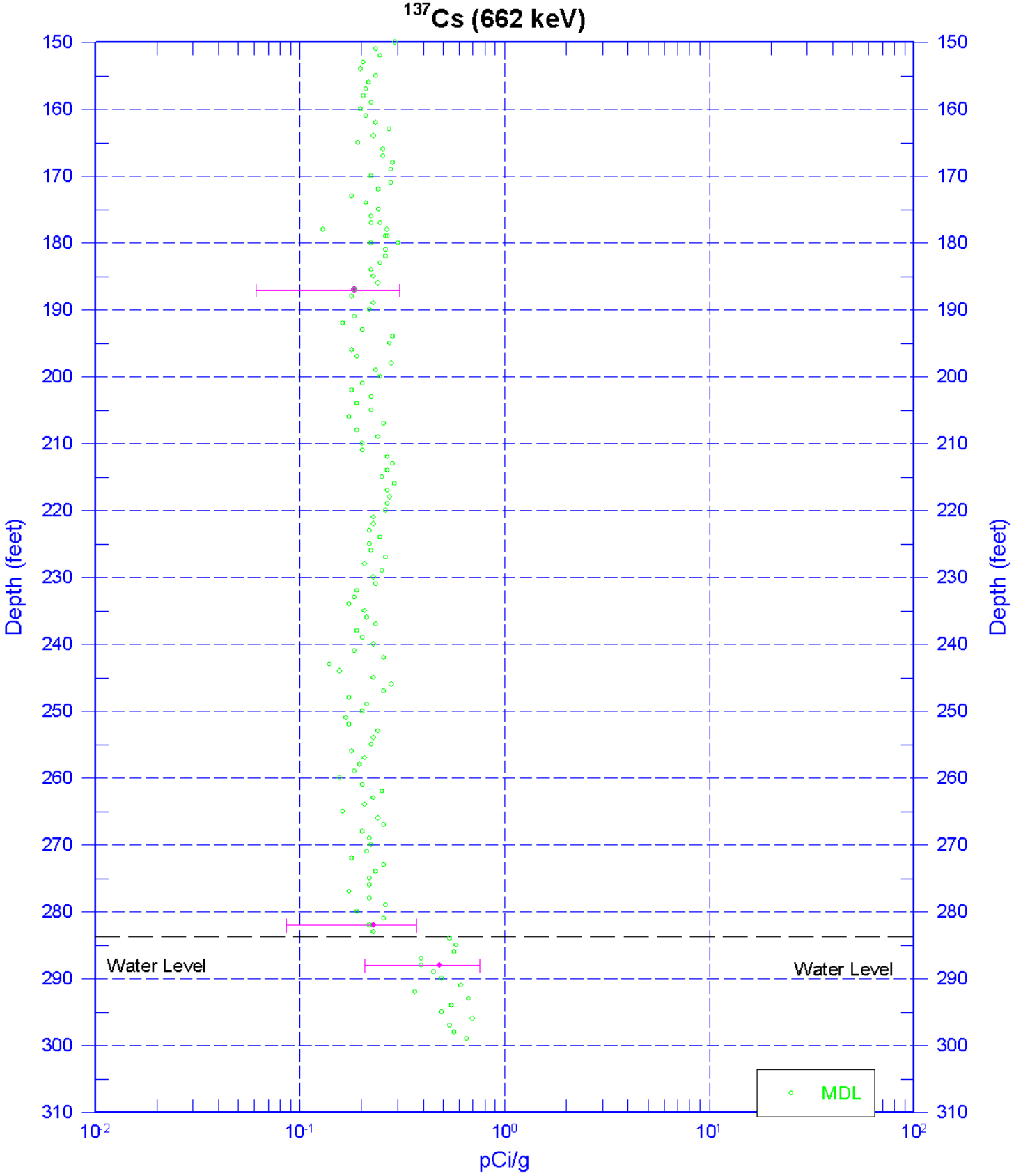
Manmade Radionuclides



Zero Reference - Ground Surface

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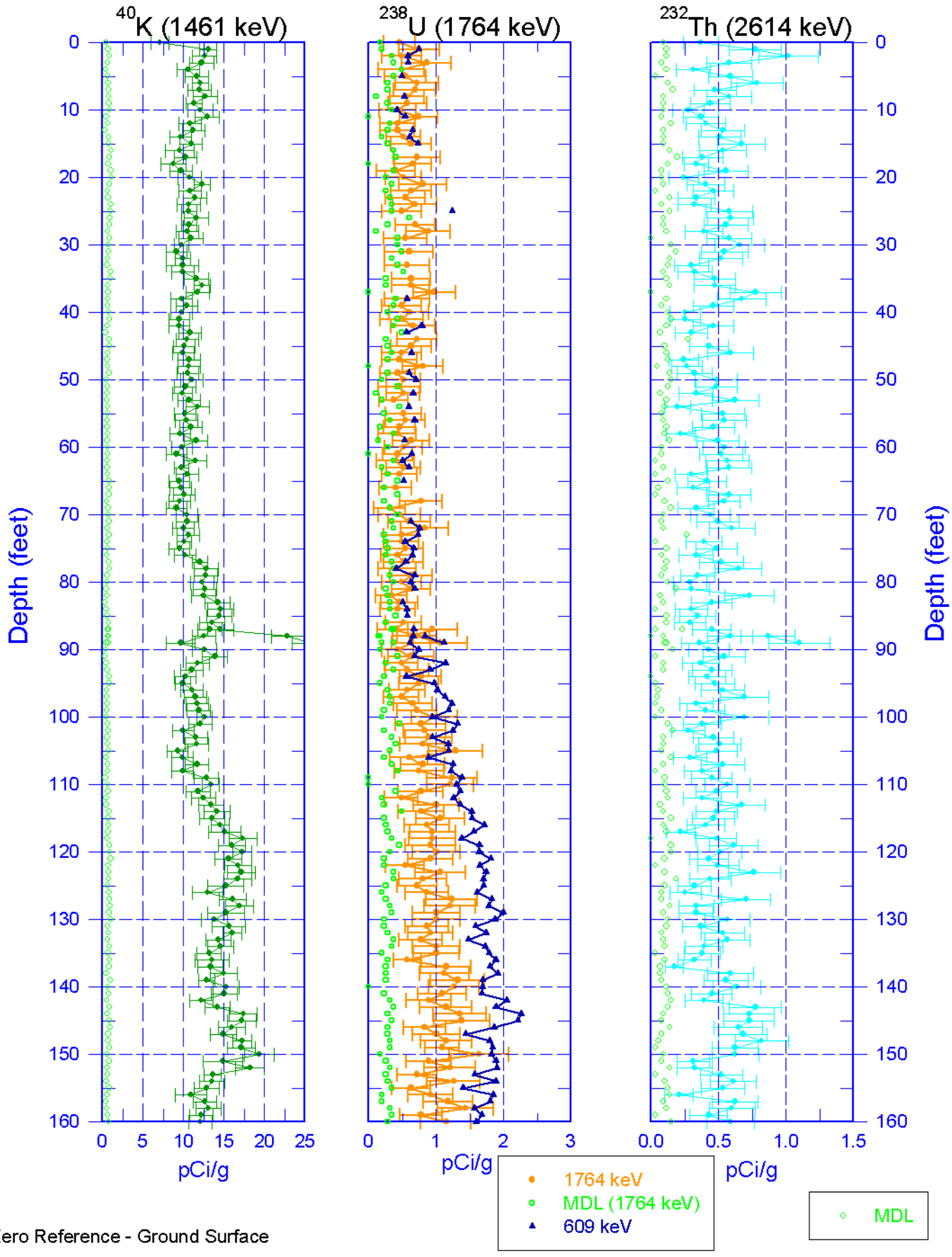
Natural Gamma Logs



Zero Reference - Ground Surface

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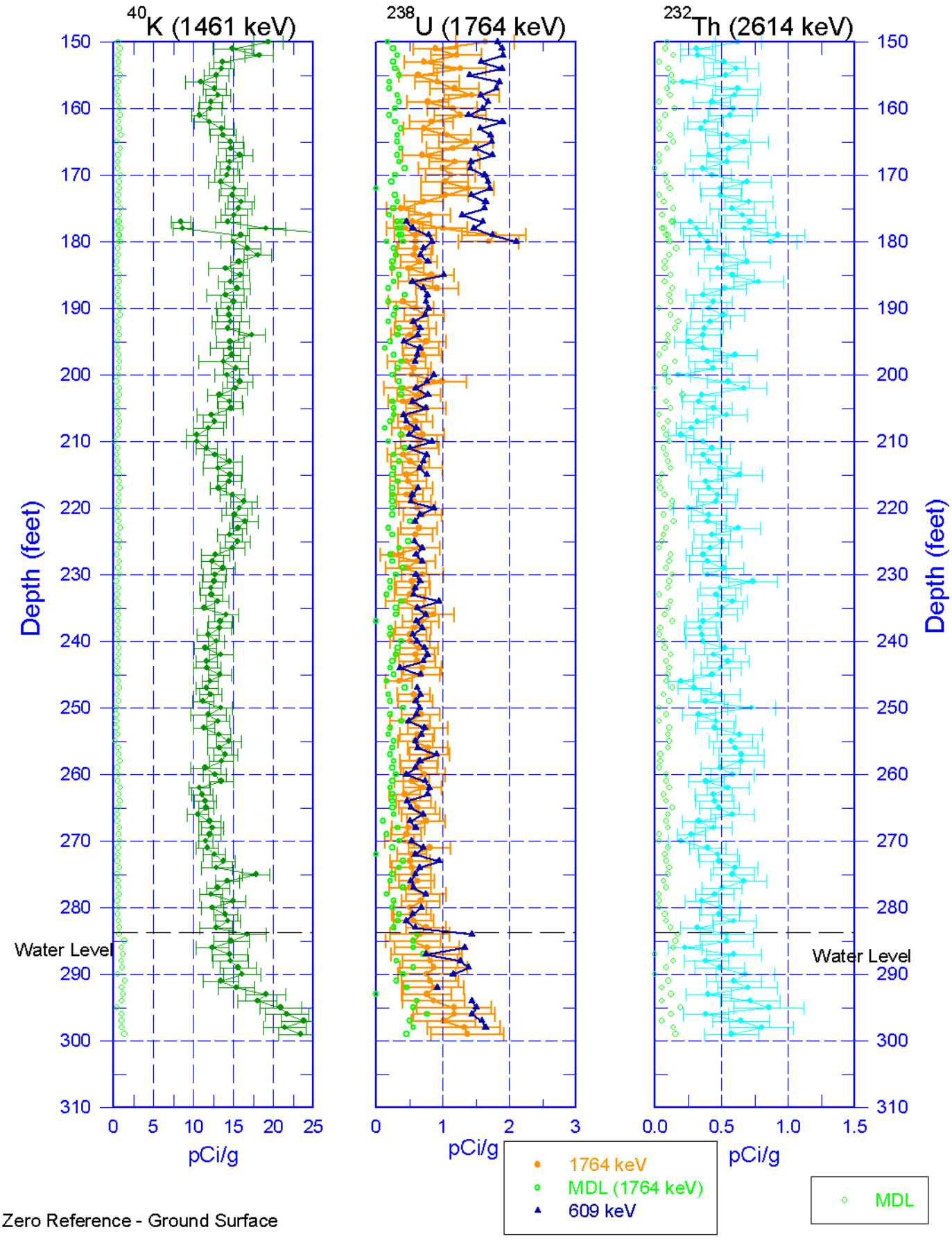
Natural Gamma Logs



Zero Reference - Ground Surface

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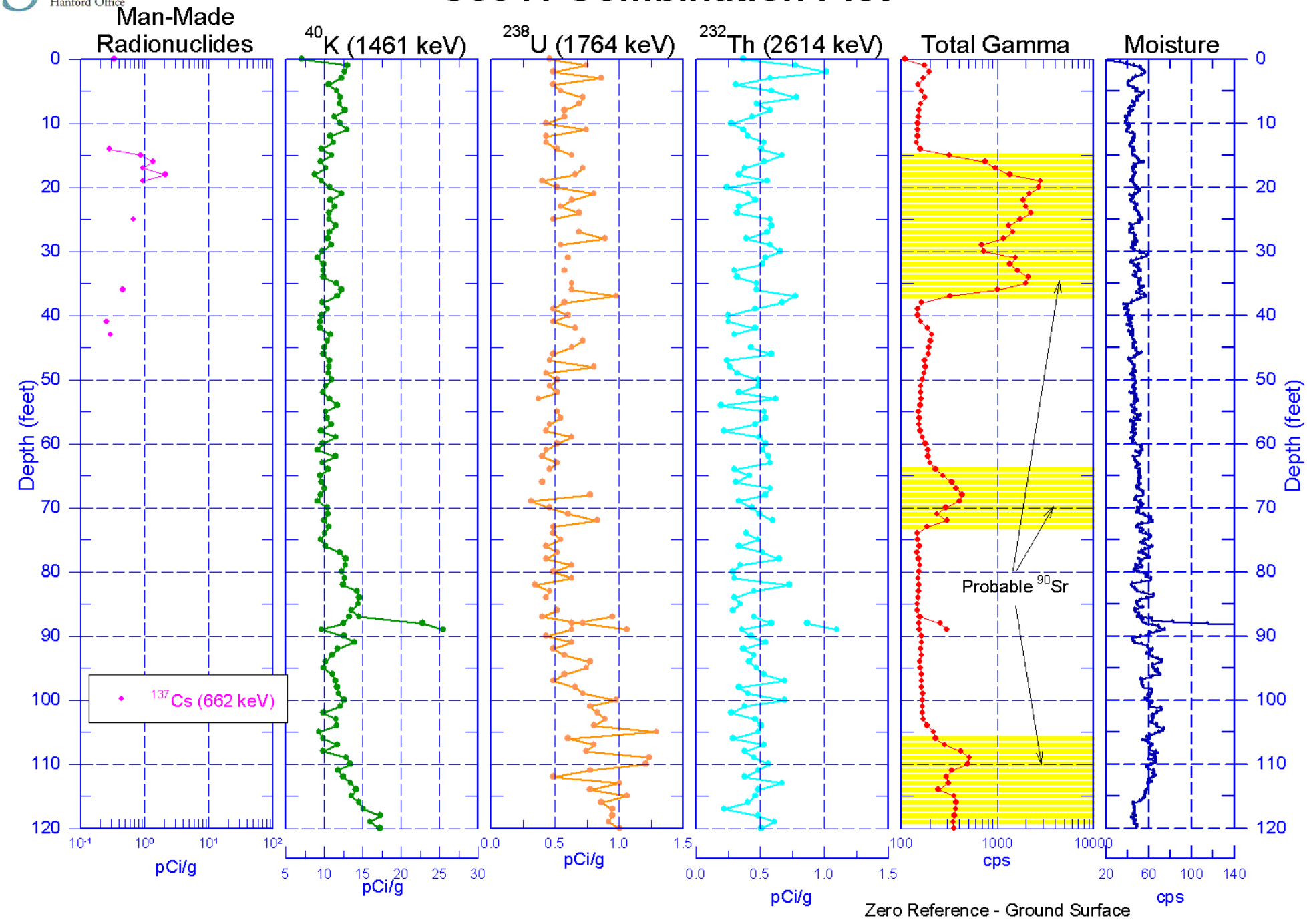
C5941 Combination Plot



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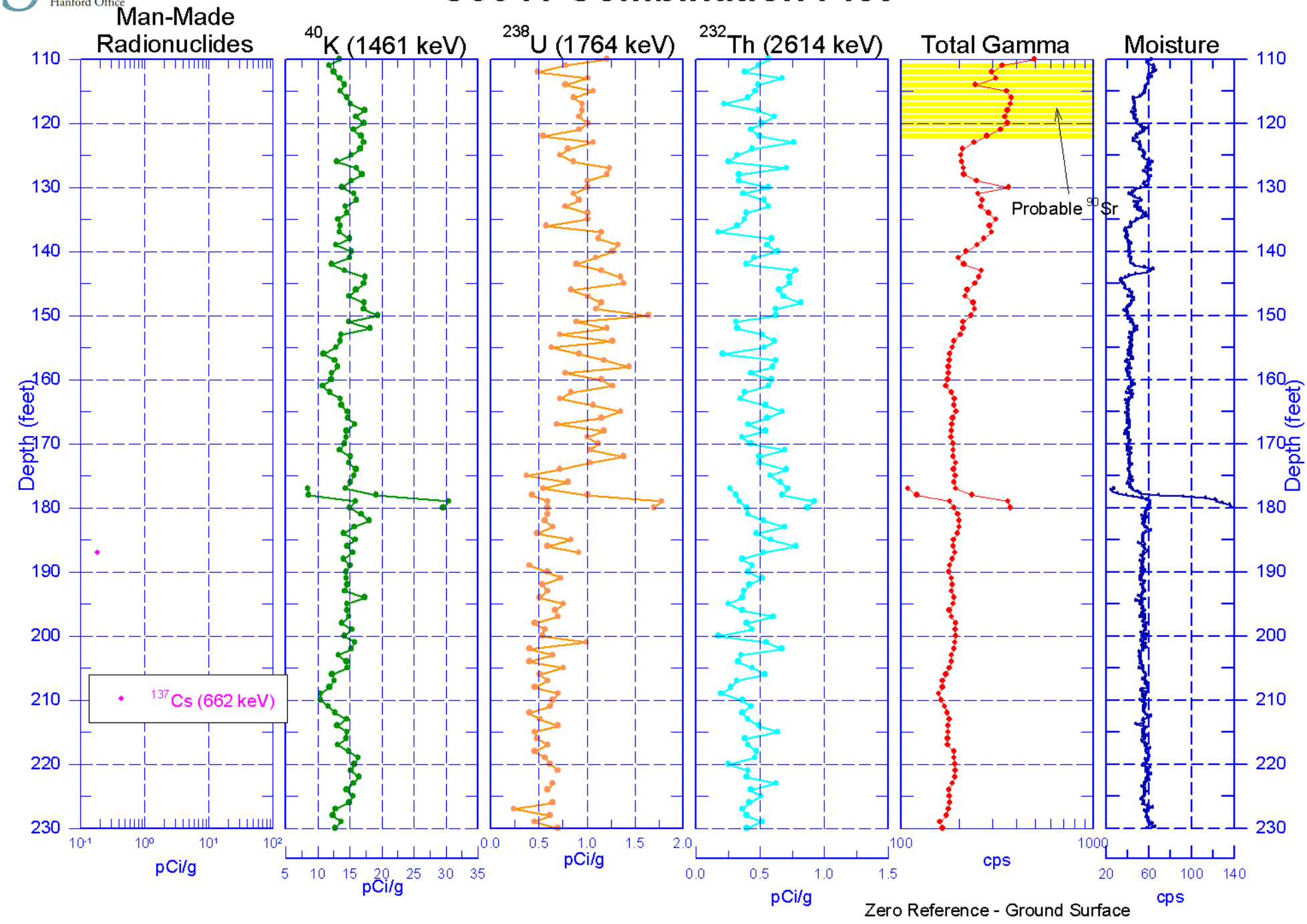
C5941 Combination Plot



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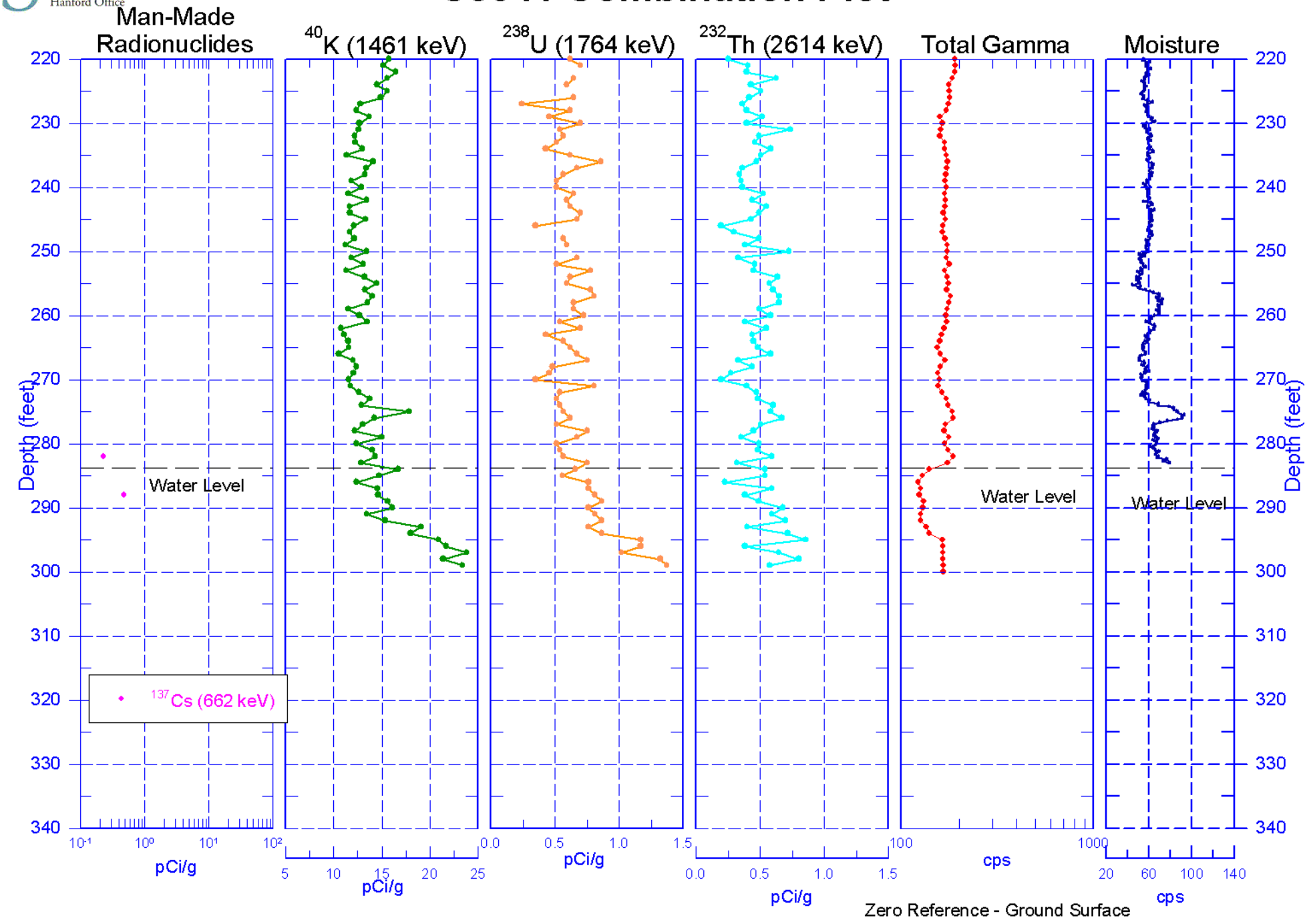

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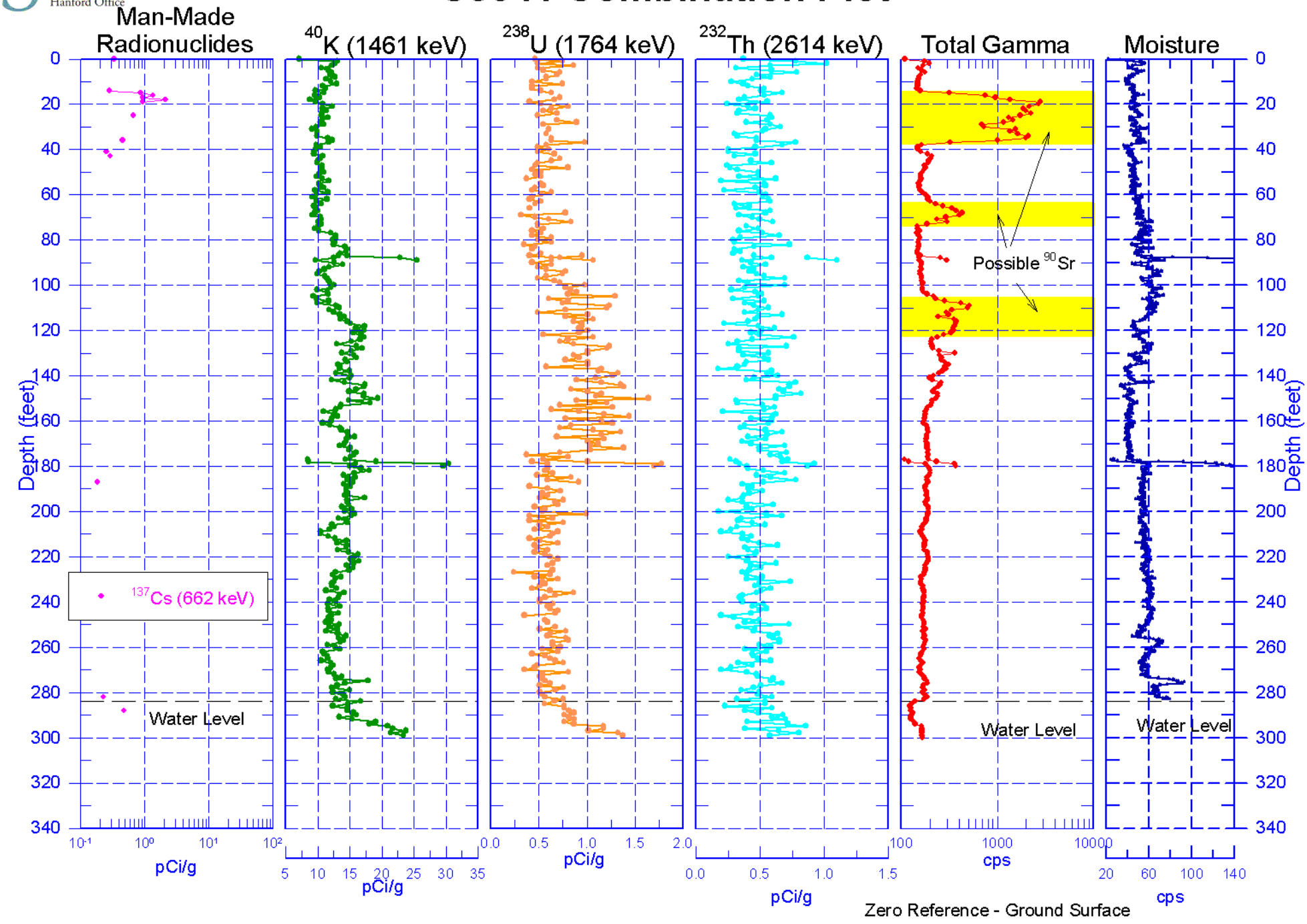
C5941 Combination Plot



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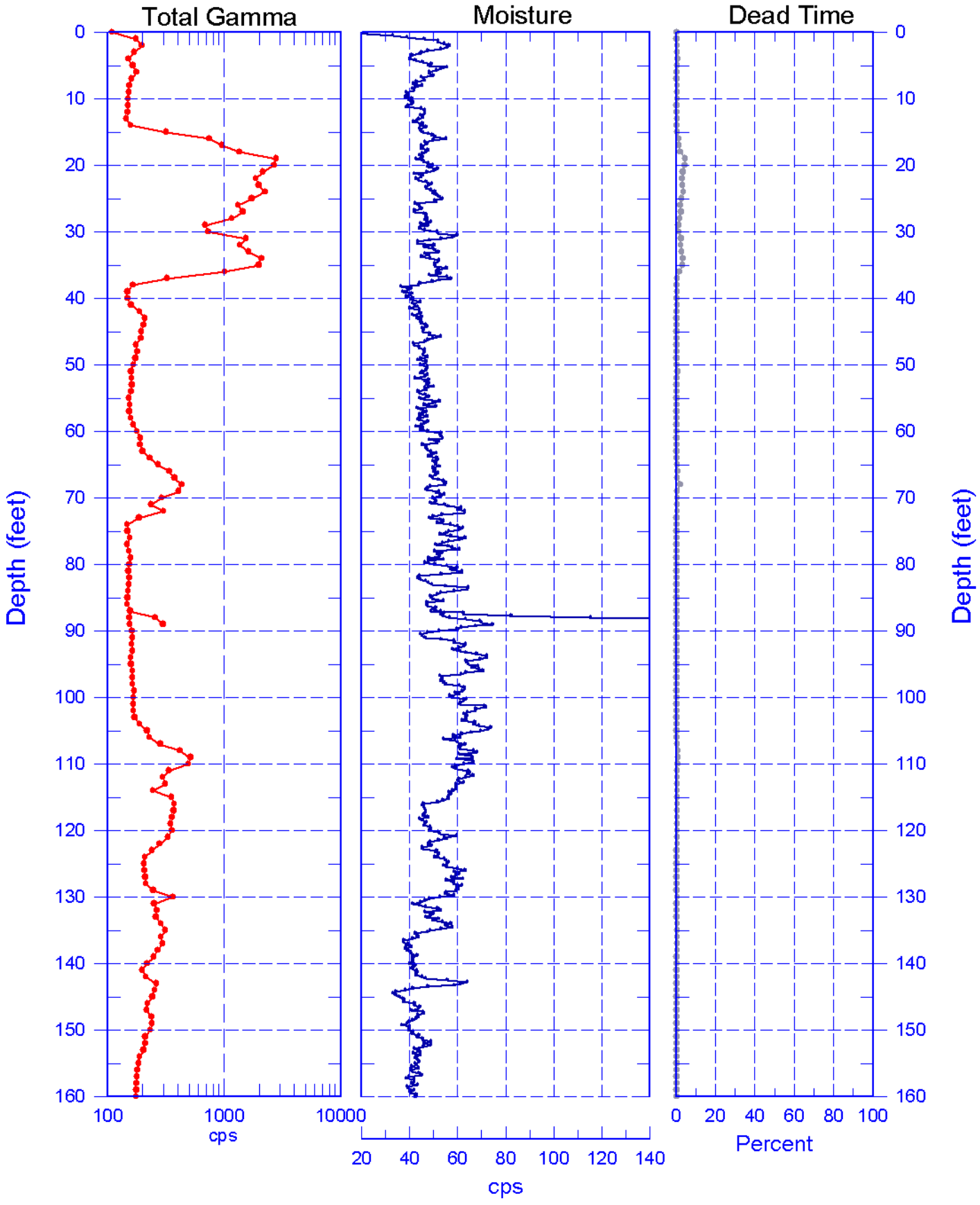
Total Gamma, Moisture & Dead Time



Reference - Ground Surface

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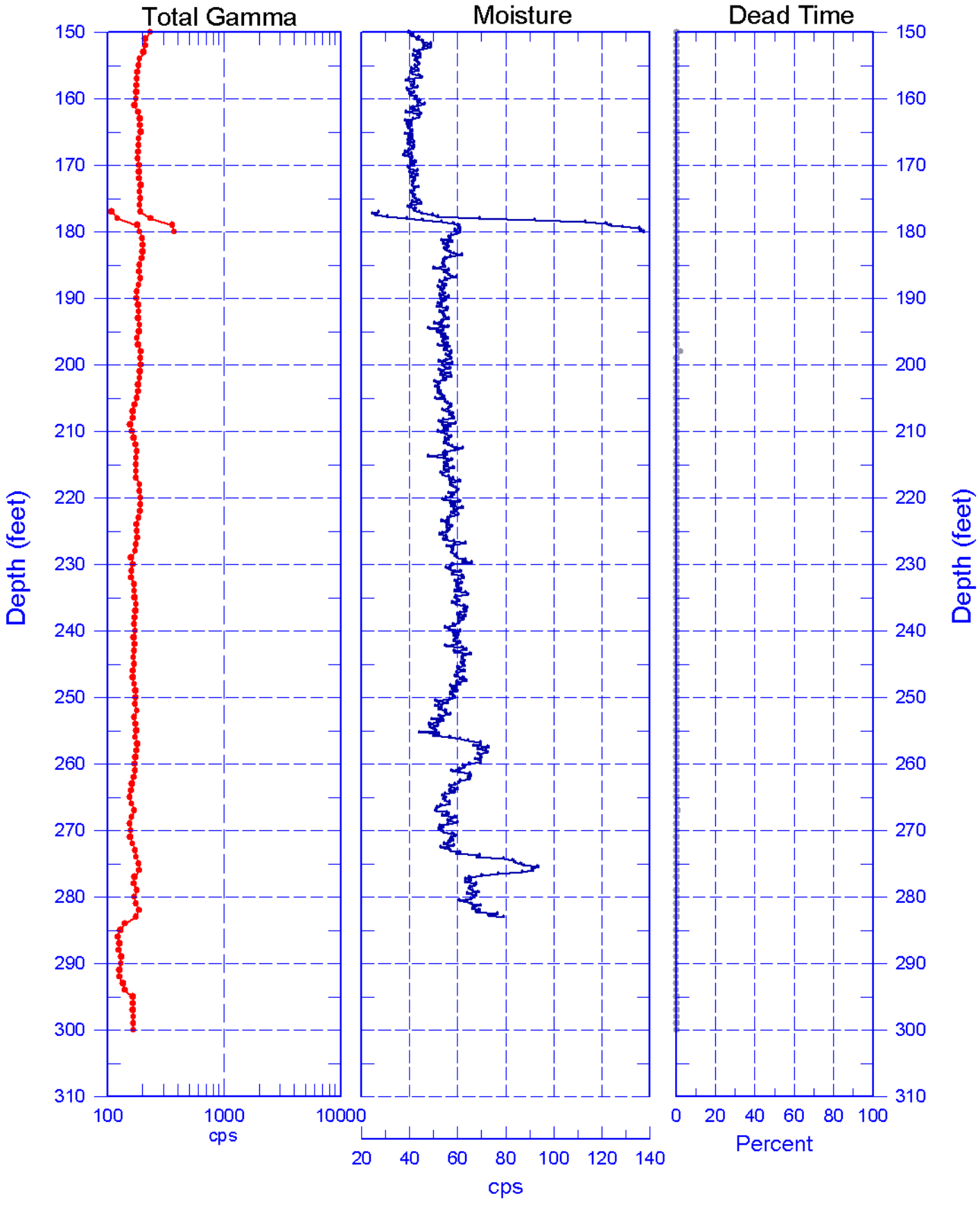
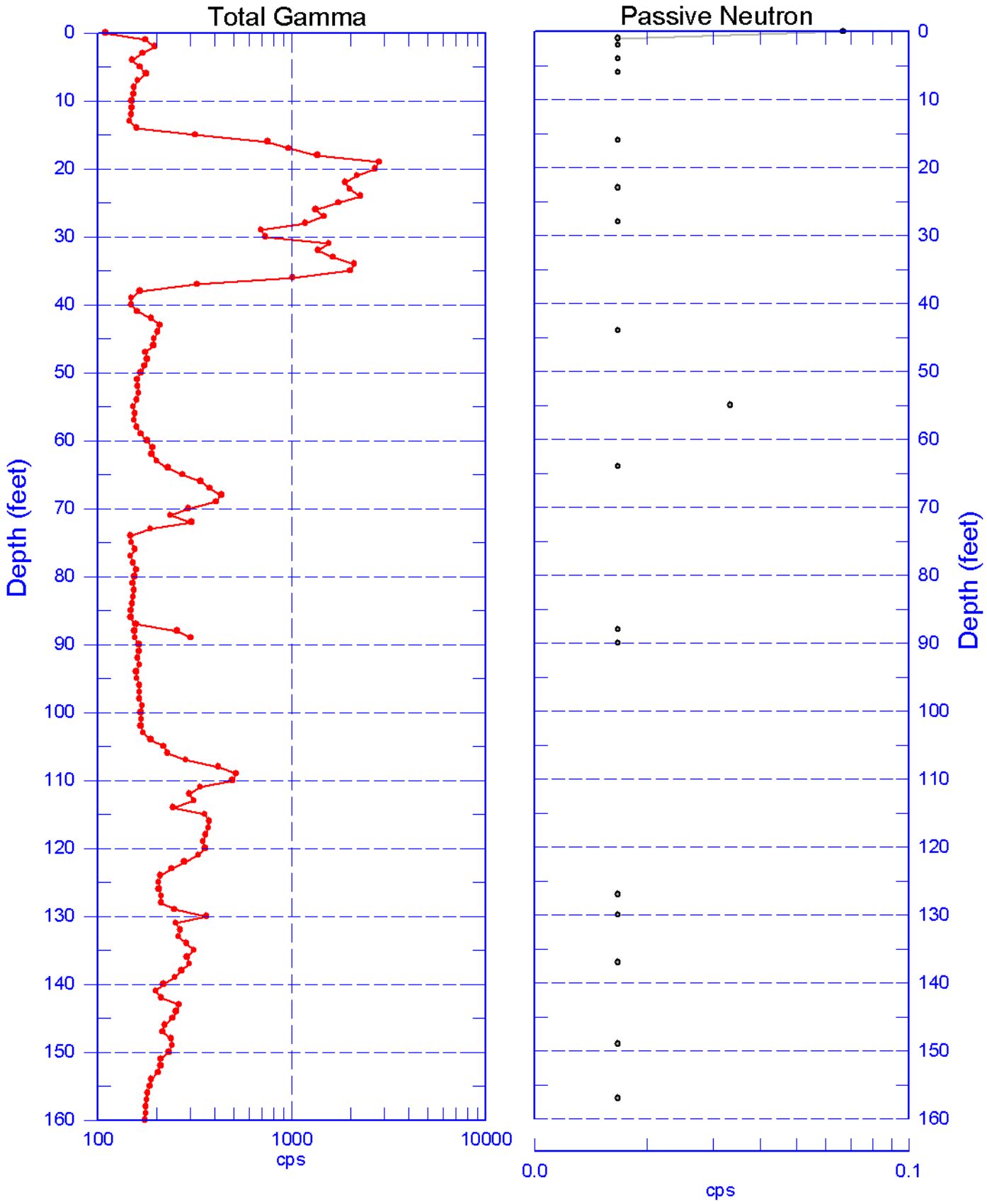
C5941
Total Gamma, Moisture & Dead Time



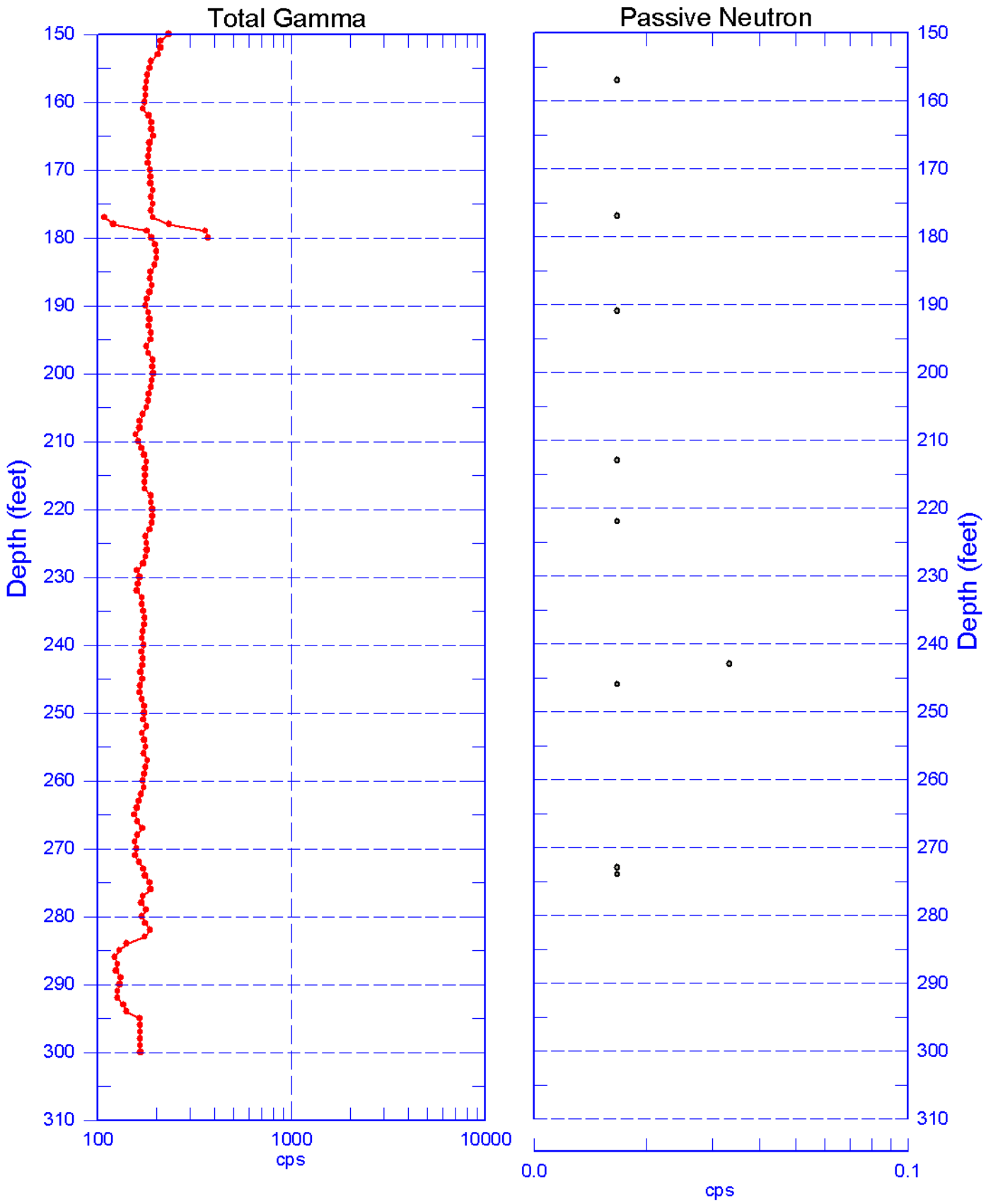
Reference - Ground Surface

C5941
Total Gamma & Passive Neutron



Reference - Ground Surface

C5941
Total Gamma & Passive Neutron



Reference - Ground Surface

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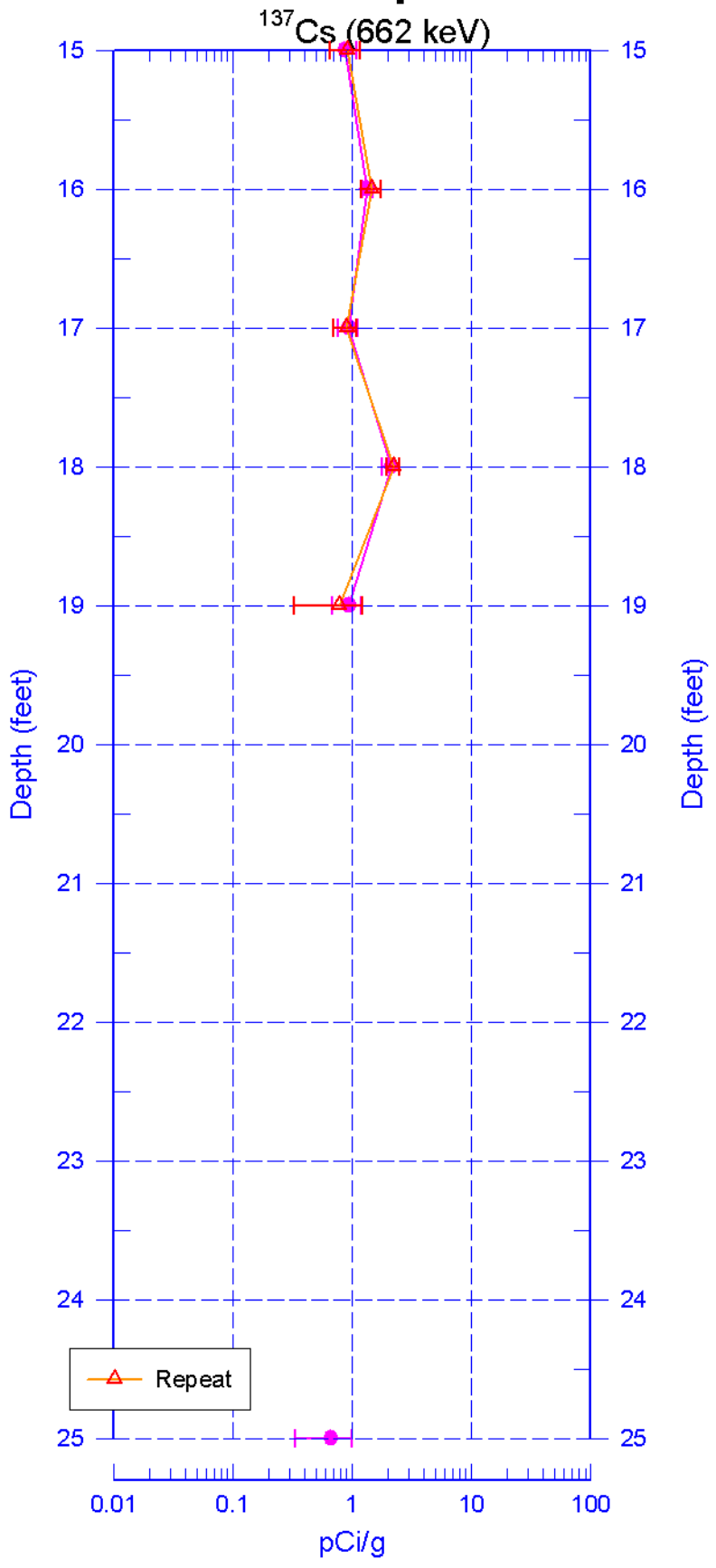
Manmade Repeat Section



Reference - Ground Surface

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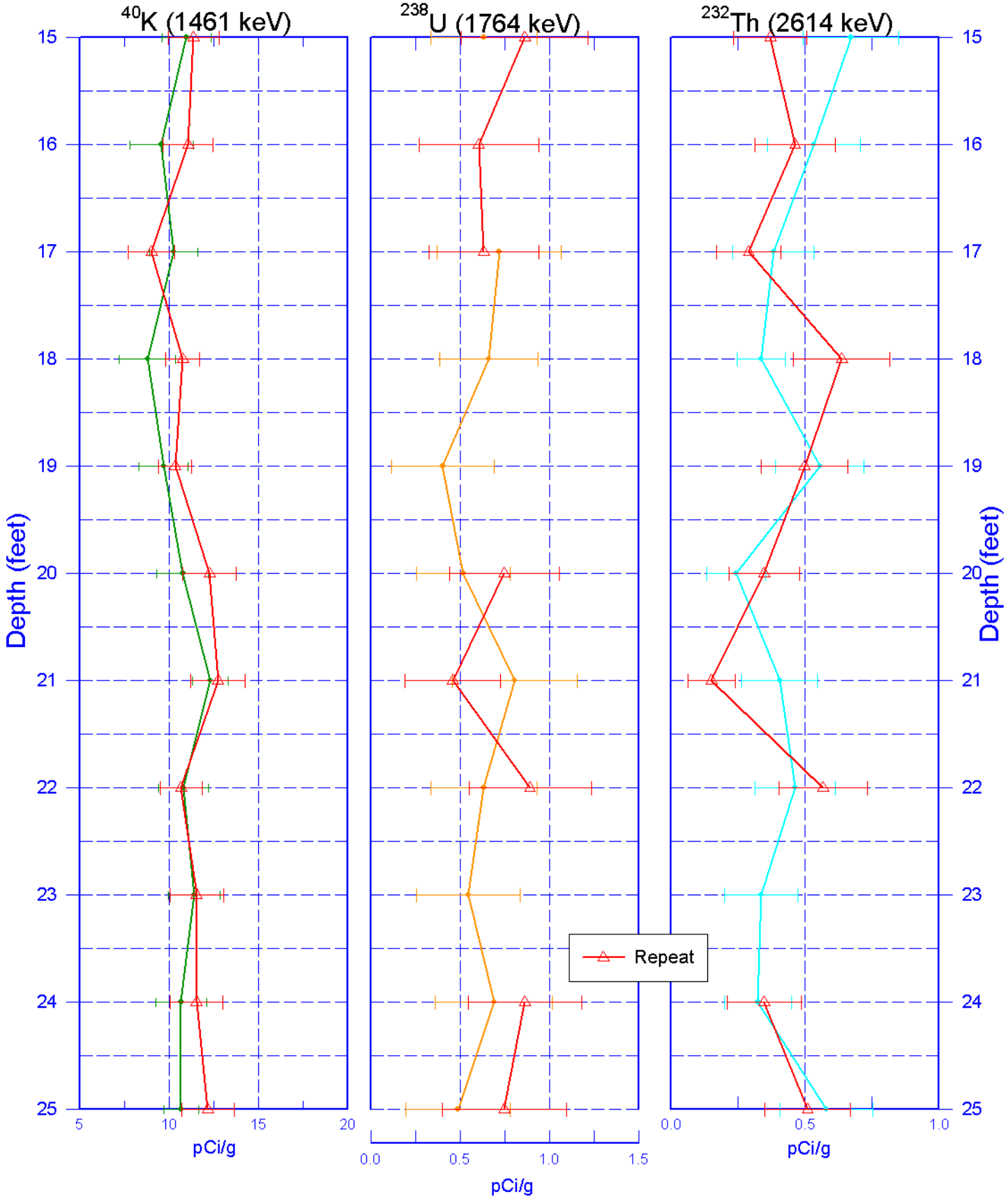
Repeat Section of Natural Gamma Logs



Zero Reference - Ground Surface

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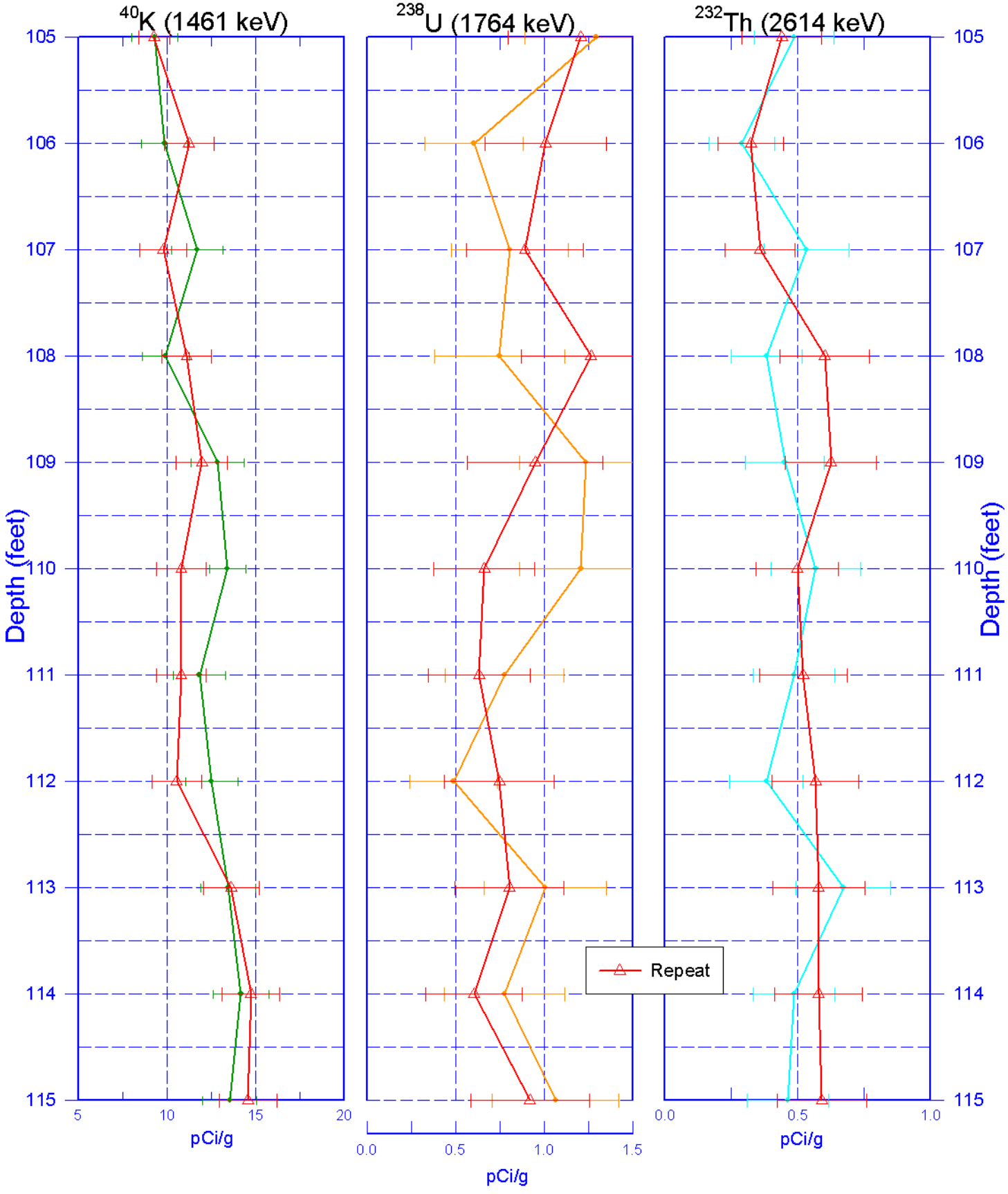
Repeat Section of Natural Gamma Logs



Zero Reference - Ground Surface

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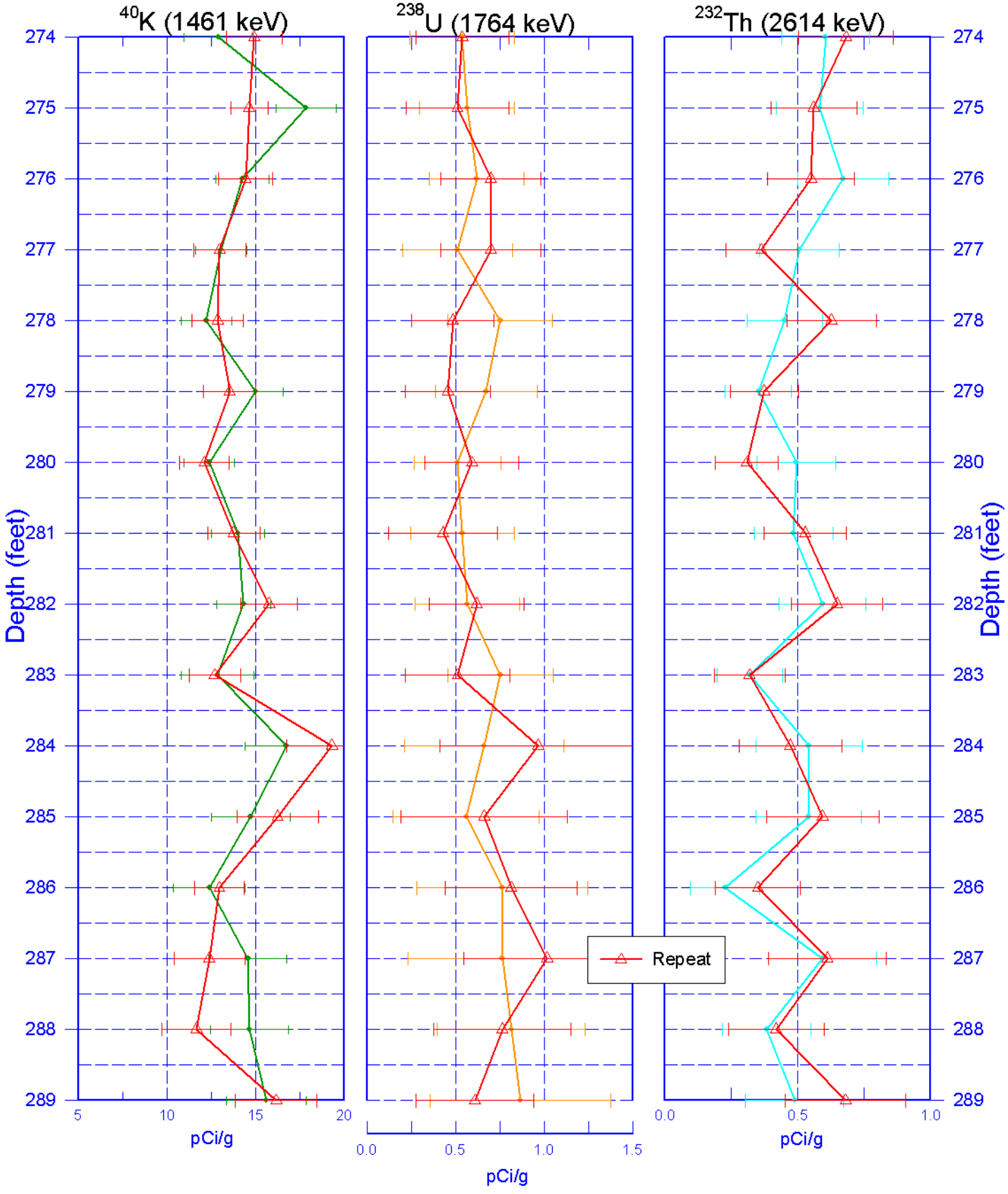
Repeat Section of Natural Gamma Logs



Zero Reference - Ground Surface

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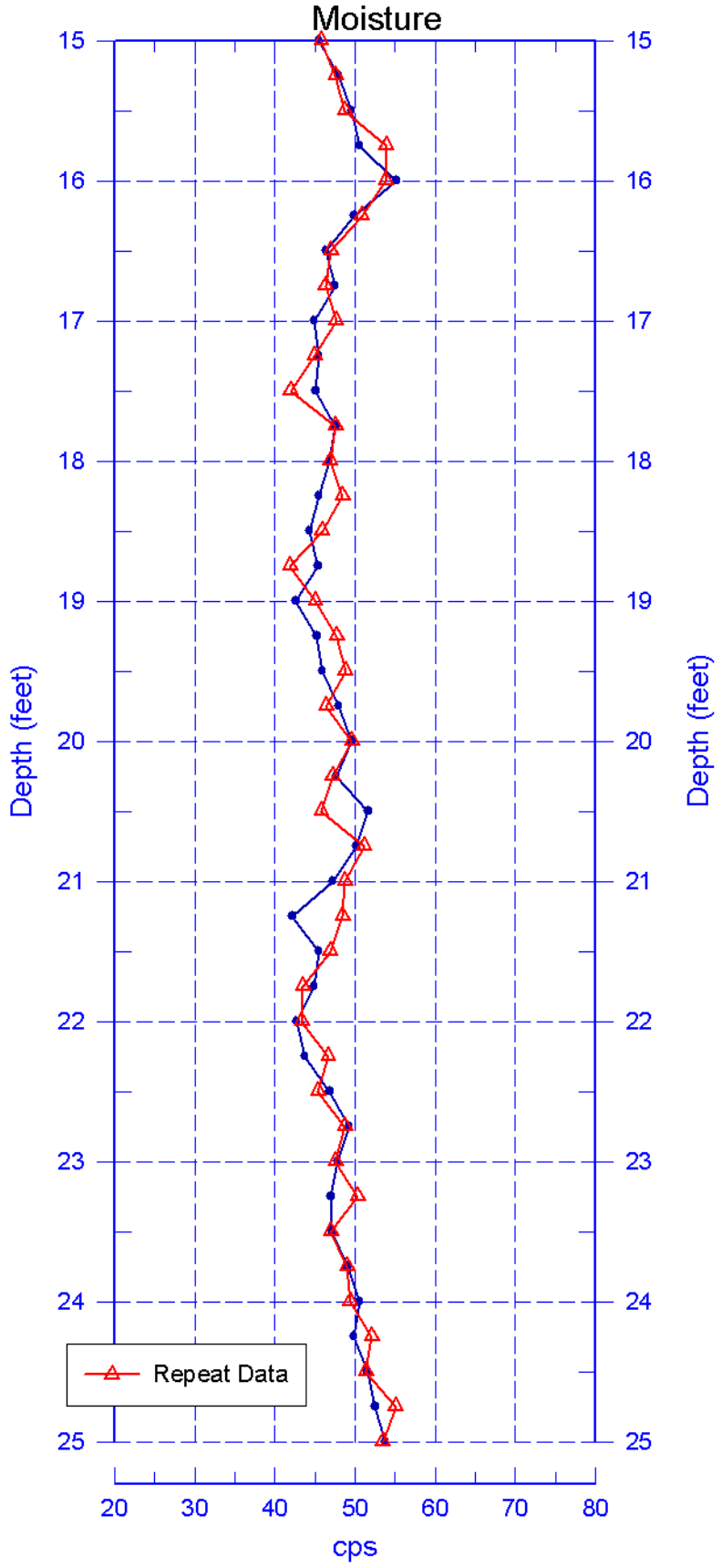
Moisture Repeat Section



Reference - Ground Surface

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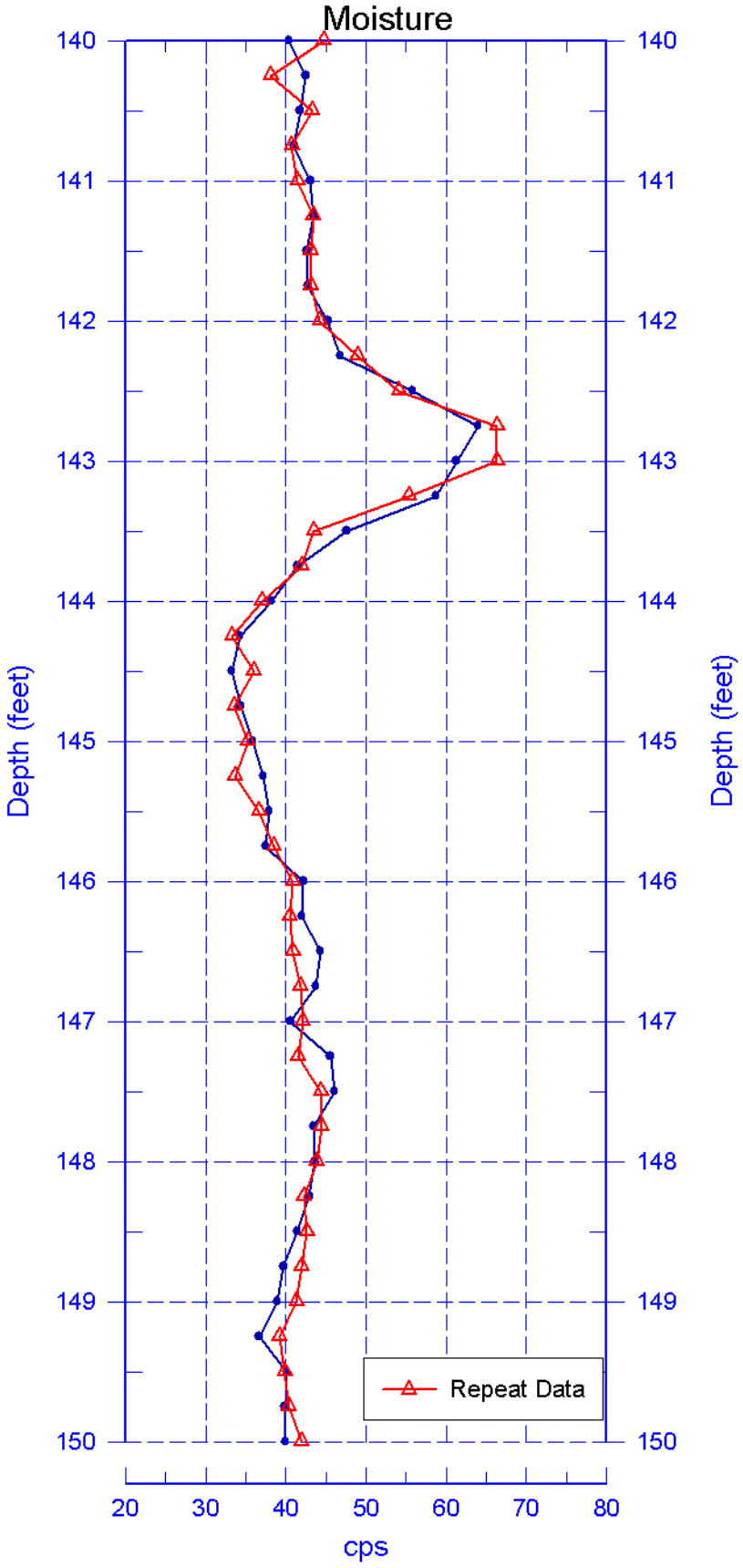
C5941
Moisture Repeat Section



Reference - Ground Surface